Self exercises (I strongly recommend every student to practice each question)

1. Assume that the vitamin B_{12} content of a multivitamin tablet is determined by the method of isotope dilution, through dissolving ten tablets in water. A 50.00-mL portion is removed and treated with 0.500 mg of radioactive vitamin B_{12} having an activity of 460 counts per minute (cpm). After homogenization, the vitamin B_{12} in the sample is isolated and purified, producing 12.25 mg with an activity of 230 cpm. How many milligrams of vitamin B_{12} in a tablet?

2. Suppose, electrochemical method was employed to determine the concentration of Ag^+ in a sample. The voltmeter recorded the cell potential of -0.100 volt. The schematic presentation of the cell and the standard reduction half cell potentials were given as follow.
   $Pt^o/Fe^{2+}(0.05M),Fe^{3+}(0.5M)//Ag^+(?M)/Ag^o$
   $Fe^{3+} + e^- \leftrightarrow Fe^{2+}$ $E^o = 0.771$volt
   $Ag^+ + e^- \leftrightarrow Ag^o$ $E^o = 0.799$ volt
   A. How much was the potential of the cathode half cell?
   B. How much was the potential of the anode half cell?
   C. How many molar of **Ag^+** was contained in the sample (around 3 decimal places)?
3. The purity of a sample of sodium oxalate, $Na_2C_2O_4$, (M.wt= 134 g/mol) is determined by titrating with a standard solution of $KMnO_4$. A 0.48 g sample was titrated by 0.0400 M $KMnO_4$ and consumed 35 mL to reach the titration's end point. What is the %w/w $Na_2C_2O_4$ in the sample?[$5C_2O_4^{2-} + 2MnO_4^- + 16\ H^+ \rightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$]
4. 20 mL of 0.015 M of $K_2Cr_2O_7$ is added to 30 mL of acidic solution containing an unknown amount of iron (II) ions until the end point is detected. How many mole of $K_2Cr_2O_7$ (around 2 decimal places) is required to completely oxidize 1 mole of Fe^{2+}?
   [Half reactions: $Cr_2O_7^{2-} \rightleftharpoons 2Cr^{3+}$ and $Fe^{2+} \rightleftharpoons Fe^{3+}$]
5. 19.06 g of $MgCl_2$ (Mwt. = 95.3 g/mol) was assayed by using excess amount of NaOH. After purification, the dried precipitate weighted 10 g. (Mwt. of $Mg(OH)_2$ = 58.3 g/mol). What was the percentage purity of the sample?
   [$2NaOH_{(aq)} + MgCl_{2(aq)} \rightarrow 2NaCl_{(aq)} + Mg(OH)_{2(s)}$]
6. The amount of I^- in a 600 mg sample was determined by a Volhard titration. After adding 50.00 mL of 0.06 M $AgNO_3$ and allowing the precipitate to form, the remaining silver was back titrated with 0.05 M KSCN, requiring 30 mL to reach the end point. What was the % w/w of I^- (Mwt of I = 126.9 g/mol) in the sample?